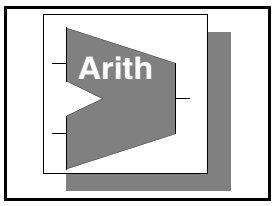
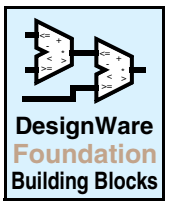




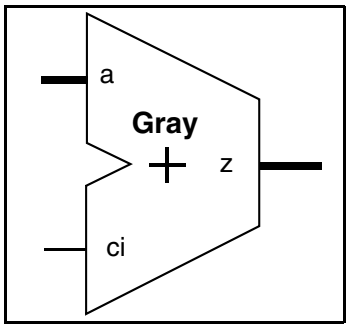
DW_inc_gray

Gray Incrementer

Version, STAR, and myDesignWare Subscriptions: IP Directory

Features and Benefits

- Parameterized word length
- Inferable using a function call



Description

DW_inc_gray adds input at `ci` to Gray coded input `a` and produces the Gray coded output `z`.

Table 1-1 Pin Description

Pin Name	Width	Direction	Function
a	*width* bits	Input	Gray coded input data
ci	1 bit	Input	Carry-in
z	*width* bits	Output	Gray coded output data

Table 1-2 Parameter Description

Parameter	Values	Description
width	≥ 1	Input word length

Table 1-3 Synthesis Implementations[a]

Implementation Name	Function	License Feature Required
rpl	Ripple-carry synthesis model	DesignWare
cla	Carry-lookahead synthesis model	DesignWare

a. During synthesis, Design Compiler selects the appropriate architecture for your constraints. However, you may force Design Compiler to use one of the architectures described in this table.

Table 1-4 Simulation Models

Model	Function
DW01.DW_inc_gray_cfg_sim	Design unit name for VHDL simulation
dw/dw01/src/DW_inc_gray_sim.vhd	VHDL simulation model source code
dw/sim_ver/DW_inc_gray.v	Verilog simulation model source code

Table 1-5 Truth Table

a - Gray Input	ci - Carry-in	z - Gray Output
000	0	000
001	0	001
011	0	011
010	0	010
110	0	110
111	0	111
101	0	101
100	0	100
000	1	001
001	1	011
011	1	010
010	1	110
110	1	111
111	1	101
101	1	100
100	1	000

Related Topics

- Math – Arithmetic Overview
- DesignWare Building Block IP User Guide

HDL Usage Through Function Inferencing - VHDL

```
library IEEE, DWARE;
use IEEE.std_logic_1164.all;
use DWARE.DW_Foundation_arith.all;

entity DW_inc_gray_func is
  generic (func_width : positive := 8);
  port (func_a  : in  std_logic_vector(func_width-1 downto 0);
        func_ci : in  std_logic;
        z_func  : out std_logic_vector(func_width-1 downto 0));
end DW_inc_gray_func;

architecture func of DW_inc_gray_func is
begin
  -- function inference of DW_inc_gray
  z_func <= DWF_inc_gray (func_a, func_ci);
end func;
```

HDL Usage Through Function Inferencing - Verilog

```
module DW_inc_gray_func (func_a, func_ci, z_func);

  parameter func_width = 8;

  input  [func_width-1 : 0] func_a;
  input                     func_ci;
  output [func_width-1 : 0] z_func;

  // pass "width" parameters to the inference functions
  parameter width = func_width;

  // Please add search_path = search_path + {synopsys_root + "/dw/sim_ver"}
  // to your .synopsys_dc.setup file (for synthesis) and add
  // +incdir+$SYNOPSYS/dw/sim_ver+ to your verilog simulator command line
  // (for simulation).
  `include "DW_inc_gray_function.inc"

  // function inference of DW_inc_gray
  assign z_func = DWF_inc_gray (func_a, func_ci);
endmodule
```

HDL Usage Through Component Instantiation - VHDL

```
library IEEE, DWARE;
use IEEE.std_logic_1164.all;
use DWARE.DW_Foundation_comp_arith.all;

entity DW_inc_gray_inst is
  generic (inst_width : positive := 8);
  port (inst_a  : in  std_logic_vector(inst_width-1 downto 0);
        inst_ci : in  std_logic;
        z_inst  : out std_logic_vector(inst_width-1 downto 0));
end DW_inc_gray_inst;

architecture inst of DW_inc_gray_inst is
begin
  -- instance of DW_inc_gray
  U1 : DW_inc_gray
    generic map (width => inst_width)
    port map (a  => inst_a,
              ci => inst_ci,
              z  => z_inst);
end inst;

-- pragma translate_off
configuration DW_inc_gray_inst_cfg_inst of DW_inc_gray_inst is
  for inst
  end for;
end DW_inc_gray_inst_cfg_inst;
-- pragma translate_on
```

HDL Usage Through Component Instantiation - Verilog

```
module DW_inc_gray_inst (inst_a, inst_ci, z_inst);

  parameter inst_width = 8;

  input  [inst_width-1 : 0] inst_a;
  input                     inst_ci;
  output [inst_width-1 : 0] z_inst;

  // Please add +incdir+$SYNOPSYS/dw/sim_ver+ to your verilog simulator
  // command line (for simulation).

  // instance of DW_inc_gray
  DW_inc_gray #(inst_width)
    U1 (.a(inst_a),
        .ci(inst_ci),
        .z(z_inst));
endmodule
```

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